

### CLAIMS

What is claimed is:

- 5 1. A method for conveying bidirectional data over a transformer comprising the steps of:  
modulating an alternating current signal with outbound data;  
driving a first side of the transformer with the modulated signal;  
receiving the modulated signal from a second side of the transformer;  
10 extracting outbound data from the received modulated signal;  
modulating according to inbound data the load presented to the second side of the  
transformer when the alternating current signal is not modulated; and  
receiving inbound data by sensing said load modulation.
- 15 2. The method of Claim 1 wherein modulating the alternating current signal with outbound  
data comprises switching the phase of an alternating current signal according to a serial  
bit stream coincident with a clock.
- 20 3. The method of Claim 1 wherein extracting outbound data comprises:  
extracting a clock signal from the received modulated signal; and  
sampling the received modulated signal according to the extracted clock signal.
- 25 4. The method of Claim 3 wherein extracting a clock signal comprises:  
sensing transitions in the received modulated signal;  
generating an independent clock signal; and  
synchronizing the independent clock with the transitions.
- 30 5. The method of Claim 1 wherein modulating the load presented to the second side of the  
transformer comprises:  
varying the impedance presented to the transformer according to a serial data stream  
coincident with an extracted clock signal.

6. The method of Claim 1 further comprising:

generating an analog signal according to the extracted outbound data signal; and  
varying the impedance of a circuit load according to the analog signal.

7. The method of Claim 1 wherein modulating the load presented to the second side of the transformer comprises:

generating a digital value according to the voltage across a circuit load coincident  
with an extracted clock signal; and  
varying the impedance presented to the second side of the transformer according to  
the digital value.

8. An apparatus for conveying bidirectional data across a galvanic barrier comprising:

signal generator;  
signal modulator capable of modulating with outbound data a signal produced by the  
signal generator;  
transformer having a first side capable of receiving a modulated signal from the signal  
modulator and a second side;  
data extractor capable of extracting outbound data from a modulated signal received  
from the second side of the transformer;  
transformer load modulator capable of modulating the load on the second side of the  
transformer according to inbound data; and  
inbound data recovery unit capable of determining inbound data by sensing load  
modulations induced by the transformer load modulator.

9. The apparatus of Claim 8 wherein the signal modulator comprises a phase modulator  
capable of altering the phase of the signal coincident with a clock.

10. The apparatus of Claim 8 wherein the data extractor comprises:

clock extractor capable of extracting a clock from a received modulated signal; and  
sampling device capable of sampling the received modulated signal according to the  
extracted clock.

11. The apparatus of Claim 10 wherein the clock extractor comprises:

controllable oscillator capable of generating a clock according to a control signal; and  
comparator capable of generating the control signal by comparing transitions in a  
received modulated signal with transitions in the generated clock.

12. The apparatus of Claim 8 wherein the transformer load modulator comprises:

impedance element;  
synchronizer capable of synchronizing inbound data with an extracted clock signal;  
and  
switch capable of attaching the impedance element to the second side of the  
transformer according to the synchronized inbound data.

13. The apparatus of Claim 8 further comprising:

digital-to-analog converter capable of generating an analog signal according to  
extracted outbound data;  
line circuit load capable of presenting a load to a communications channel;  
impedance element; and  
analog gate capable of linearly imparting the impedance element across the line  
circuit load according to the analog signal.

14. The apparatus of Claim 8 further comprising:

line circuit load capable of presenting a load to a communications channel;  
analog-to-digital converter capable of generating a digital value according the voltage  
present across the line circuit load;  
impedance element; and  
switch capable of attaching the impedance element to the second side of the  
transformer according to the digital value.

15. A system-side isolation controller comprising:

signal generator;

signal modulator capable of modulating a signal produced by the signal generator; and  
inbound data recovery unit capable of determining inbound data by sensing load  
modulations exhibited by a transformer.

- 5     16. The system-side isolation controller of Claim 15 further comprising a transformer driver  
capable of driving the transformer with the modulated signal.

17. A line-side isolation controller comprising:

- 10     data extractor capable of extracting outbound data from a modulated signal received  
from a second side of a transformer; and  
transformer load modulator capable of modulating the load presented to the second  
side of the transformer according to inbound data.

18. The line-side isolation controller of Claim 17 wherein the data extractor comprises:

- 15     clock extractor capable of extracting a clock signal from a received modulated signal;  
and  
sampling device capable of sampling the received modulated signal according to the  
extracted clock signal.

- 20     19. The line-side isolation controller of Claim 18 wherein the clock extractor comprises:  
controllable oscillator capable of generating a clock according to a control signal; and  
comparator capable of generating the control signal by comparing transitions in a  
received modulated signal with transitions in the generated clock.

25     20. The line-side isolation controller of Claim 17 further comprising:

- digital-to-analog converter capable of generating an analog signal according to  
extracted outbound data;  
analog gate capable of linearly imparting a first impedance element across a line  
30     circuit load according to the analog signal;

analog-to-digital converter capable of generating a digital value according the voltage  
present across the line circuit load;  
impedance element; and  
switch capable of attaching a second impedance element the second side of the  
transformer according to the digital value.

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